

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Takashi Horai et al.  
 Application No. : 10/693,314  
 Filed : October 24, 2003  
 For : METHOD AND APPARATUS FOR RECORDING DATA IN  
 OPTICAL RECORDING MEDIUM AND OPTICAL RECORDING  
 MEDIUM

Examiner : Latanya Bibbins  
 Art Unit : 2633  
 Docket No. : 890050.445  
 Date : December 7, 2006

Commissioner of Patents  
 Washington, DC 20231

DECLARATION OF TAKASHI HORAI  
UNDER 37 C.F.R. § 1.131

Sir:

I, Takashi Horai, hereby declare as follows:

1. I am one of the co-inventors of the above-listed patent application which has been filed in the U.S. Patent and Trademark Office. I am also the first named inventor on this application which has been filed.

2. We, the inventors, had conceived of, and reduced the present invention to practice prior to September 10, 2002, the filing date of U.S. Patent Application No. 2003/0067857 to Shirota et al. (hereafter "Shirota et al.") In particular, prior to September 10, 2002, we, the named inventors, had reduced to practice the invention of claims 1-12 of the above-referenced application as originally filed.

3. As evidence of our having conceived and reduced to practice the invention prior to the date of September 10, 2002, attached herewith as Exhibit A is a copy of two pages evidencing reduction to practice of the invention. These documents provide evidence of actually carrying out the practice of the invention and the operation of working examples. (The boxes marked with the numbers #1, #2, #3, #4 and #5 have been added by the U.S. patent attorney for ease of reference in the translation.)

4. Exhibit A is a document prepared by the inventors evidencing the practicing of the invention. This document, in Japanese, shows on pages 1 and 2 actual examples being carried out practicing the claimed invention. In particular, as can be seen looking at the example on page 1, the power  $nT_{top}$  is 1.8 and the ratio of the power  $Ph/Pm$  has been set in Example 1 to be 1.43. (In the application filed in the U.S.,  $nT_{top}$  is referred to as  $t_{top2}$  and the recording power was represented as  $Pw$  in place of  $Ph$ , so this corresponds to a ratio of  $Pw/Pm$  of 1.43 of the claimed invention.) See column 2 of the chart showing the example on page 1 of Exhibit A. Turning now to page 2 of Exhibit A, further results of working examples of the invention are shown. On page 2, a chart is provided that has working examples each labeled as Example 1, Example 2 and Example 3 by the U.S. patent attorney. In addition, in each of the examples, the recording level  $nT_{top}$  has been set to 1.8, 1.9, and 1.7, respectively, so that in each example this power is equal to or greater than 1.7 T, which is a feature of the claims.

5. As can be seen from the second page of Exhibit A, the conditions for recording in the reduction to practice of the invention presented as examples 1, 2 and 3 were provided as the working examples having the recording conditions 1, 2 and 3 in the application as filed.

6. Page 2 also contains further evidence of the invention being reduced to practice in the note I added at the bottom, enclosed in Box #5. This note states that the recording was conducted with an  $nT_{top}$  of 1.9 and the  $Ph/Pm$  of 1.45. This is further evidence of practicing the invention. Thus, Exhibit A provides the evidence of the actual working examples for the reduction to practice of the present application as filed in the U.S. Patent and Trademark Office.

7. I further declare that page 1 of the attached Exhibit A was completed prior to July 12, 2002. It was provided on July 12, 2002 by TDK to the patent firm of Oishi and Partners to prepare the present application. Page 2 of Exhibit A was personally prepared by me on July 16, 2002. This page 2 was prepared by myself by adding the additional working examples on page 2 to the electronic document which had existed as page 1. For example, as can be seen, pages 1 and 2 are identical in many respects except for the additions I made on page 2 on July 16, 2002. Page 1 has one working example which shows an operational embodiment of the invention as now claimed. When page 2 was prepared, I added two additional examples of carrying out the present invention to further verify the parameters of operation as now claimed in

Application No. 10/693,314

the present application. Therefore, on page 2, I personally added the data of examples 2 and 3. In addition, I added the note at the bottom that in example 2 the recording was carried out with an nTtop of one of 1.9 T and a ph/pm of 1.45. I then noted that such a result had never been obtained before. This can be seen as the additional box on the lower part of page 2 of Exhibit A.

8. In conclusion, Exhibit A, pages 1 and 2, provides actual working examples of the inventors having reduced to practice the claimed invention and having provided these working examples to the patent attorneys in Japan who prepared the application for filing to cover the present invention which was subsequently filed in the U.S. Patent and Trademark Office.

9. While the documents of Exhibit A do not on the face thereof have a date, I have personally verified that date of Exhibit A, page 1 to be completed by July 12, 2002 and page 2 to have been prepared by me personally on July 16, 2002.

10. Further, we provided these documents to the patent attorney in Japan of Mr. Oishi's firm, who prepared the application on behalf of TDK on the date of July 12, 2002 and shortly after July 16, 2002, respectively. These were used to prepare a new application, bearing Japanese Application No. 2002-316216, which was subsequently filed in the United States in correspondence to the present application.

I hereby declare that all statements made herein of our own knowledge are true and that all statements made on information or belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the captioned patent application or any patent issued therefrom.

Dec. 6, 2006  
Date

Takashi Horai  
Takashi Horai

Attachment: Exhibit A  
701 Fifth Avenue, Suite 6300  
Seattle, Washington 98104-7092  
Phone: (206) 622-4900  
Fax: (206) 682-6031  
174372\_1.DOC

CLK

write pulse for 3T

write pulse for 4T

write pulse for over 5T

Basic pattern of Non-multi pulse for 4x speed

○上はDVD-R4倍速記録で提案されているストラテジです。

#1

	type1	type2
3T <sub>top</sub>	2.25	2.25
4T <sub>top</sub>	2.60	2.50
nT <sub>top</sub>	1.50	1.50
nT <sub>wt</sub>	(n-1)	(n-1)
nT <sub>lp</sub>	1.00	1.00

Basic Write Strategyとして左記の2タイプが決められています。  
メディアによって最適なパワー比があり、おそらく実機ではその比率のもとに  
最適パワーをコントロールするはずですが、  
ですがTDK内での検討の結果、この2タイプの5T以上のT<sub>top</sub>を長めにして  
Ph/Pm比を大きく(Pmを小さく)した方が、ジッターの-marginが広がる結果が得られました。

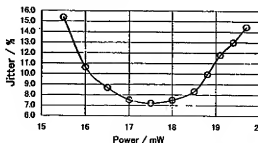
#2

「実施例」 Example

	type2	実施例 ~ Example
3T <sub>top</sub>	2.25	2.25
4T <sub>top</sub>	2.50	2.50
nT <sub>top</sub>	1.50	1.80
nT <sub>wt</sub>	(n-1)	(n-1)
nT <sub>lp</sub>	1.00	1.00

Ph/Pm 1.38 1.43

Jitter-margin (4x)



Example

○ type2

実施例

#3

理由の推測ですが、  
・5T以上のマークにはPm(ミドルパワー)を設定して記録するので、Ph/Pm比とT<sub>top</sub>(トップパルス)とT<sub>lp</sub>(ラストパルス)でマーク長を調節できます。  
たとえばTDKメディアはPh/Pm 1.38、18mW程度で特性ボトムになります。  
高パワーになったときにはPh/Pm 1.38ではなく、Pm比を上げたほうが実は特性が良い。  
しかしPh/Pm比はドライブでは固定である。  
それに対し、実施例はT<sub>top</sub>長めにすることでマーク長を形成しているので、Pmの依存性がより小さい。  
よってジッターの劣化が小さい。

「効果」

・ドライブのパワーバラツキ、メディアの感度バラツキに対しては広いmarginを持っていたほうが良いので、実施例ストラテジが有効。

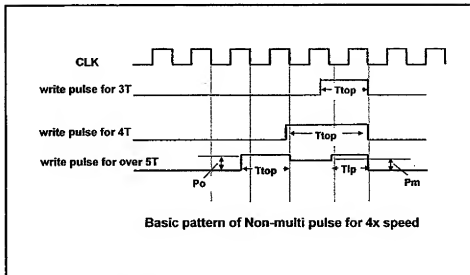
「手段」

Basic Write Strategyよりも、5T以降のマークのT<sub>top</sub>長めに、Pm小さくする。  
好ましくはnT<sub>top</sub> 1.70T以上2.00T以下。(いま実施例が1つしかないです。近々検討の予定)。

Exhibit A, page1

CONFIDENTIAL

#4



○上はDVD-R4倍速記録で提案されているストラテジです。

#1

	type1	type2
3Ttop	2.25	2.25
4Ttop	2.60	2.50
nTtop	1.50	1.50
nTwt	(n-1)	(n-1)
nTtp	1.00	1.00

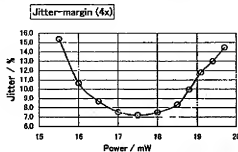
Basic Write Strategyとして左記の2タイプが決まられています。  
メディアによって最適なパワー比があり、おそらく実機ではその比率のもとに  
最適パワーをコントロールするはずですが、  
ですがTDK内での検討の結果、この2タイプの5T以上のTtopを長めにして  
Ph/Pm比を大きく(Pmを小さく)した方が、ジッターのマージンが広がる結果が得られました。

#2

「実施例」Example 1 Example 2 Example 3

	type2	実施例1	実施例2	実施例3
3Ttop	2.25	2.25	2.25	2.25
4Ttop	2.50	2.50	2.50	2.50
nTtop	1.50	1.80	1.90	1.70
nTwt	(n-1)	(n-1)	(n-1)	(n-1)
nTtp	1.00	1.00	1.00	1.00

Ph/Pm 1.38 1.43 ? ?



○ type2

実施例1

Example1

理由の推測ですが、  
・5T以上のマークにはPm(ミドルパワー)を設定して記録するので、Ph/Pm比とTtop(トップパルス)とTtp(ラストパルス)でマーク長を調整できます。  
たとえばTDKメディアはPh/Pm 1.38、18mW程度で特性ボトムになりますが、  
高パワーになったときにはPh/Pm 1.38ではなく、Pm比を上げたほうが実は特性が良い。  
しかしPh/Pm比はドライブでは固定である。  
それに対し、実施例はTtop長めにしてマーク長を形成しているので、Pmの依存性がより小さい。  
よってジッターの劣化が小さい。

#3

「効果」  
ドライブのパワーバラツキ、メディアの感度バラツキに対しては広いマージンを持っていたほうが良いので、  
実施例ストラテジが有効。

「手段」  
Basic Write Strategyよりも、5T以降のマークのTtop長めに、Pm小さめにする。  
好ましくはnTtop 1.70T以上2.00T以下。(いま実施例が1つしかないです。近々検討の予定)。

「実施例2」  
上記 nTtop を1.9Tとし、Ph/Pmを1.45として記録した。  
(結果はまだありません)

#5

**TRANSLATION OF MARKED TEXT PORTIONS OF  
EXHIBIT A FROM HORAI DECLARATION**

*Note: The phrases provided between square brackets “[ ]” are supplied by the interpreter, while the phrases between the parentheses “( )” are found in the original Japanese texts.*

**TEXT #1**

“Depicted above is a strategy proposed for 4X DVD-R recordings.”

**TEXT #2**

“Two types of strategies, shown left, have been adopted as Basic Write Strategy. Since the optimum power ratio depends on the media, an optimum power in actual devices would likely be controlled under such ratio.

However, the research within TDK has revealed that grater margins for jitter is obtained in these two types by using longer Ttop and larger Ph/Pm ratio (*i.e.*, smaller Pm) for 5T or above.”

**TEXT #3**

“The possible mechanism is as follows:

In recordings for marks of 5T or above, Pm (middle power) is adopted. Therefore, the mark length can be adjusted by Ph/Pm ratio, Ttop (top pulse) and Tlp (last pulse). For example, TDK's media gives a bottom [jitter] characteristic at around Ph/Pm = 1.38 and 18mW. In reality, the media shows a better performance for a higher power if [Ph/Pm ratio is increased, instead of Ph/Pm = 1.38.

However, the [conventional] drive has a fixed Ph/Pm ratio.

Contrary [to the conventional drive], the [present] example shows smaller dependency on Pm because the mark length is formed with extended Ttop. As a result, reduction of deterioration in the jitter is achieved.

**‘Advantages’**

Wide margins are favorable in light of fluctuations in power of drives and in sensitivity of media, thus, the strategy in the example is advantageous.

**‘Means’**

For marks of 5T or above, Ttop is set longer and Pm is set smaller than those for Basic Write Strategy. Preferably, nTtop is set between more than or equal to 1.70 T and less than or equal to 2.00 T. (We have obtained only one example at this stage. Now we are planning to research in the near future.)“

**TEXT #4**

“Improvement Regarding Write Strategy --- 4X DVD-R Recording Media”

**TEXT #5**

“ ’Example 2’

The recording has been conducted with the nTtop of 1.9 T and the Ph/Pm of 1.45. (The result has never before been obtained.)”